



Small Engine Repair Technology

Program of Studies
2014-2015



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Small Engine Repair Technology

Course Title	Post-Secondary Connection	Valid Course Code	Recommended Grade Level								Recommended Credit
			6	7	8	9	10	11	12		
SMALL ENGINE REPAIR I	SET 100	470821						X	X	.5	
SMALL ENGINE REPAIR I LAB	SET111	470813						X	X	.5	
SMALL ENGINE REPAIR II	SET 110	470812						X	X	.5	
SMALL ENGINE REPAIR LAB II	SET 235	470833						X	X	.5	
SMALL ENGINE ELECTRICAL SYSTEMS	SET 200	470840						X	X	.5	
SMALL ENGINE ELECTRICAL SYSTEMS LAB	SET 220	470841						X	X	.5	
TWO STROKE CYCLE ENGINE (SMALL ENGINE)	SET 250	470822						X	X	.5	
TWO STROKE CYCLE ENGINE LAB	SET 118	470823						X	X	.5	
FOUR STROKE CYCLE ENGINE (SMALL ENGINE)	SET 240	470814						X	X	.5	
FOUR STROKE CYCLE ENGINE LAB (SMALL ENGINE)	SET 221	470815						X	X	.5	
SMALL ENGINE REPAIR/FAILURE AND ANALYSIS	SET 233	470816						X	X	.5	
SMALL ENGINE REPAIR/FAILURE AND ANALYSIS LAB	SET 237	470817						X	X	.5	
* CO-OP I (SM ENG)	SET 199	329101						X	X	1	
* CO-OP II (SM ENG)	SET 299	329102						X	X	2	
* CO-OP III (SM ENG)	SET 199/299	329103						X	X	3	

SMALL ENGINE REPAIR TECHNOLOGY EDUCATION

Overview of Small Engine Repair Technology Education

Purpose:

The vision of Kentucky Small Engine Repair Technology Education is to promote safety standards and performance standards, enhance leadership, provide relevant curriculum, and to be vital to the education of all students.

Kentucky Small Engine Repair Technology Education will:

- Operate as the center for nationally recognized industry standard training.
- Provide a critical link in school to employment or postsecondary education.
- Develop stronger relationships with the community in terms of mutual advocacy, cooperative field experiences, employment placement, and support for relevant student organizations and competitions
- Represent an important component in the education of all students.
- Require and promote critical thinking and problem solving.
- Offer an up to date curriculum based on standards that adapts to changes in the industry.
- Integrate academic skills into the Automotive Technology Education Curriculum in order to insure that students develop written & verbal communications skills, computational skills, and scientific/math problem-solving skills.

Career Pathways:

*Outdoor Power Equipment and Small Engine Mechanic

*Small Engine Mechanic

Standard Based Curriculum

The curriculum is composed of industry standards based competencies/tasks. Therefore, the teaching/learning focus is on the final results rather than the process.

Kentucky Occupational Skill Standards

The Kentucky Occupational Skill Standards are the performance specifications that identify the knowledge, skills, and abilities an individual needs to succeed in the workplace. Identifying the necessary skills is critical to preparing students for entry into employment or postsecondary education. These standards described the necessary **occupational, academic, and employability** skills needed to enter the workforce or post-secondary education in specific career areas. There is an ongoing effort to continue to refine these standards by which exemplary Transportation Education Programs are evaluated and certified. This helps insure that curriculum meets industry specifications.

Work Based Learning

Cooperative experience, internships, shadowing and mentoring opportunities provide depth and breadth of learning in the instructional program and allow students to apply the concepts learned in the classroom. The Work Base Learning Guide is available on the KDE webpage: www.education.ky.gov.

Student Organizations and Competitions

Participation in Skills USA Competition provides a vehicle for students to employ higher order thinking skills, to interact with high-level industry people and to further enhance their leadership skill through their participation in regional, state and national competitive events and local activities.

Small Engine Repair Pathways

Career Pathway	Pathway Courses	Elective Courses
<p>Outdoor Power Equipment and Small Engine Mechanic</p> <p>CIP Code 47.0606.00</p> <p><u>Tests for Certification</u> EETC 4 Stroke Engine EETC 2 Stroke Engine EETC Electrical</p>	<p>*FOUR STROKE CYCLE ENGINE AND LAB (SMALL ENGINE) *TWO STROKE CYCLE ENGINE AND LAB (SMALL ENGINE) *SMALL ENGINE ELECTRICAL SYSTEMS AND LAB *SMALL ENGINE REPAIR/FAILURE AND ANALYSIS AND LAB</p> <p><i>NOTE: SMALL ENGINE REPAIR I AND LAB I and SMALL ENGINE REPAIR II AND LAB II must be completed before a student can begin the Outdoor Power Equipment and Small Engine Mechanic Pathway.</i></p>	No Electives.
<p>Small Engine Mechanic</p> <p>CIP Code 47.0606.01</p> <p><u>Tests for Certification</u> EETC 4 Stroke Engine EETC 2 Stroke Engine EETC Electrical</p>	<p>*SMALL ENGINE REPAIR II AND LAB II *FOUR STROKE CYCLE ENGINE AND LAB (SMALL ENGINE) *TWO STROKE CYCLE ENGINE AND LAB (SMALL ENGINE) *SMALL ENGINE ELECTRICAL SYSTEMS AND LAB</p> <p><i>NOTE: SMALL ENGINE REPAIR I AND LAB I must be completed before a student can begin the Small Engine Mechanic Pathway.</i></p>	No Electives.

Sample Small Engine Repair Career Pathway

KENTUCKY CAREER PATHWAY/PROGRAM OF STUDY TEMPLATE									
COLLEGE/UNIVERSITY:						CLUSTER: Transportation			
HIGH SCHOOL (S):						PATHWAY:			
						PROGRAM: Small Engine Repair			
GRADE	ENGLISH	MATH	SCIENCE	SOCIAL STUDIES	REQUIRED COURSES RECOMMENDED ELECTIVE COURSES OTHER TECHNICAL EDUCATION COURSES		CREDENTIAL CERTIFICATE DIPLOMA DEGREE	SAMPLE OCCUPATIONS	
9	English I	Algebra I	Earth Science	World History	Health & PE	Computers	Word Processing		
10	English II	Geometry	Biology	US History	Elective	Spreadsheets	Accounting		
11	English III	Algebra II	Introduction to Chemistry	Foreign Language	SET 100/111 SMALL ENGINE REPAIR and Lab I	SET 110/235 Small Engine Repair and Lab II	SET Small Engine Repair Electrical Systems and Lab		
12	English IV	Foreign Language	Introduction to Physics	Arts & Humanities	SET 250/118 Two Stroke Engine and Lab	SET 240/221 Four Stroke Engine and Lab	SET 233/237 Small Engine Repair/Failure and Analysis and Lab	• Equipment & Engine Training Council Certification o Two Stroke o Four Stroke	
Year 13	Industry Training and Employment. Honda, Briggs and Stratton, John Deere, Yamaha, Sears.							Small Engine Technician, Shop Owner, Sales Representative, Parts Distributor.	
Year 14									
Year 15									
Year 16									
	Required Courses								
	Recommended Elective Courses								
	Other Elective Courses								
	Career and Technical Education Courses								
	Credit-Based Transition Programs (e.g. Dual/Concurrent Enrollment, Articulated Courses, 2+2)								
	⚡ =High School to Comm. College) (* =Comm. College to 4-Yr. Institution) (# = Opportunity to test out)								
	Mandatory Assessments, Advising, and Additional Preparation								
	(0056/020011) Revised Jan. 2015 October 2016 CTE/Kentucky								

Small Engine Repair Courses/Tasks

Small Engine Repair I and Lab I

Valid Course Codes

Class: 470821

Lab: 470813

Course Description

This course introduces the student to small engines and their various applications. Also included are the identification and demonstration of hand tools, special tools, and measuring tools. It covers the selection and use of shop manuals and applying safety procedures when working with small engines.

Content/Process

Students Will:

1. The student is instructed on how to properly identify a manufacturer's model number, serial number and type number for two and four stroke engines.
2. The student can explain 2 stroke cycle engine operating theory.
3. The student can explain piston ported type and reed valve type.
4. The student can describe the normal combustion process, pre-ignition and its effects, detonation and its effects.
5. The student can identify 2 stroke components and parts and explain their purpose.
6. The student can explain 4 stroke cycle engine operating theory.
7. The student can identify 4 stroke components and parts and explain their purpose.
8. The student can describe engine block and nomenclature and function.
9. The student can describe crankcase, cylinder, cylinder head nomenclature and function.
10. The student can describe piston, piston pin and piston rings and types.
11. The student can describe connecting rod, bearings and crankshaft nomenclature and function.
12. The student can describe engine bearing types, oil seal types and service application.
13. The student can describe crankshaft types and service application.
14. The student can describe valve train, valve retainer types, nomenclature and function.
15. The student can demonstrate an understanding of crankshaft angle and valve timing degrees.
16. The student can describe "valve overlap" and its function.
17. The student can describe lubrication systems nomenclature and function.

18. The student can describe the purpose of an ignition system and its nomenclature and function.
19. The student can identify the components and function of a battery ignition system.
20. The student can identify the components and function of an electronic ignition system.
21. The student can identify the components and function of a magneto ignition system.
22. The student understands the concept of heat transfer and the purpose of a cooling system.
23. The student can define the major types of cooling systems used on power equipment.
24. The student can describe air-cooled system nomenclature and function.
25. The student can list major causes of air-cooled engine overheating.
26. The student can describe normal service procedures performed on an air-cooled engine.
27. The student can describe the purpose of a liquid-cooled engine.
28. The student can identify the components and function of a liquid-cooled engine.
29. The student can properly pressure test a liquid-cooled system.
30. The student can list major causes of liquid-cooled engine overheating.
31. Student can describe normal service procedures performed on an air-cooled engine.
32. The student can identify the basic types of fuel systems used in power equipment
33. The student can identify the function of each component in the fuel system including carburetor, fuel filter, fuel pump, electronic fuel injector
34. The student can identify types of carburetor designs and nomenclature and function.
35. The student can describe nomenclature and function of vacuum-feed, diaphragm, float, rotary, slide valve carburetors.
36. The student can identify and describe the idle circuit and the main circuit.
37. The student can discuss the venturi principle, variable venturi carburetors, and terms.
38. The student can describe enrichment devices including choke types purging systems and primer types.
39. The student can describe the function of a fixed orifice jet, high speed nozzle, emulsion tube, and purging system.
40. The student can explain the purpose of a fuel filter.
41. The student can identify the common types of fuel filters and describe the difference between micron and mesh.

42. The student can identify the common types of fuel pumps and describe fuel pump nomenclature and function.
43. The student can describe accelerator pump nomenclature and function.
44. The student can explain the theory, function, and components of electronic fuel injection (EFI).
45. The student can explain the theory, function, and components of gaseous fuels.
46. The student can describe air filter nomenclature and function.
47. The student can list 5 types of air filters used on small engines.
48. The student can describe the normal service procedures performed on each type of air filter system.
49. The student can describe exhaust system nomenclature and function as well as types and terms associated with exhaust systems
50. The student can describe the theory and function of a single stage catalyst (catalytic converters).
51. The student can describe the proper service cleaning procedures for exhaust ports and spark arrestor screens.
52. The student can describe engine starting systems, nomenclature and function.
53. The student can identify the components of a recoil starting system and describe the function of each.
54. The student can identify the components of a DC electric starting system and describe the function of each.
55. The student can identify the components of an AC electric starting system and describe the function of each.
56. The student can list 5 types of air filters used on small engines.
57. The student can describe the operation of a break-away clutch used on AC and DC electric starter motors.
58. The student can perform 12 volt DC starter motor current draw test.
59. The student can remove and replace a starter motor and remove, test and replace starter relay (solenoid).

Connections:

- *Common Core State Standards
- *KOSSA
- *Common Core Technical Standards
- *New Generation Science Standards
- *Post-Secondary: KCTCS SET 100
- *CTSO's – Skills USA

Small Engine Repair II and Lab II

Valid Course Codes

Class: 470812

Lab: 470833

Course Description

This course introduces the student to the principles of construction and operation of internal combustion engines including the definitions of the following trade terms: valve overlap, reed valve, two-stroke cycle engine and four-stroke cycle engine.

Content/Process

1. The student can identify terminals and connectors used in electrical systems.
2. The student can explain electrical/electronic terms that are common to the power equipment industry.
3. The student can identify types of charging systems including: Under flywheel alternator, belt drive alternator. Describe a DC amps test, describe an AC volts test, describe the function of a diode, describe resistance test, perform current draw test using a DC shunt or equivalent, remove & replace regulator/rectifier.
4. The student can describe series circuit, parallel circuit, and explain different types of circuit failures.
5. The student can demonstrate applicable test procedures for testing series and parallel circuits.
6. The student can check continuity in circuits and electrical system components.
7. The student can check current flow in electrical systems and components.
8. The student can inspect, test and replace fusible links, fuses and circuit breakers.
9. The student can identify electrical wire sizes and selection based on anticipated current load.
10. The student can identify sending units used in an electrical circuit and explain their function,
11. The student can demonstrate safe work habits when working with electrical/charging systems and circuits.
12. The student can explain storage battery theory and operation.
13. The student can remove, clean and replace battery, perform specific gravity test on battery cell electrolyte, and determine battery state of charge using DMM (Digital Multi-Meter).
14. The student can explain proper procedure for battery disposal based on EPA and local ordinance.
15. The student can identify the purpose of the governor system.
16. Student can identify electrical wire sizes and selection based on anticipated current load
17. Student can describe governor system nomenclature and function, including: Pneumatic (air vane) governor system, mechanical governor system; Perform dynamic governor adjustments

18. Student can describe the theory of lubrication.
19. Student can describe (generally) API oil ratings.
20. Student can describe the meaning of SAP viscosity ratings.
21. Student can describe the classification of 2 stroke oils.
22. Student can describe ISO/LEG 2 stroke oil standard, A, B, C, D.
23. Student can describe Jaso oil standard, classification FA, FB ,FC.
24. Student can describe NEMA (BTA) oil standard classification pc, pcw-1, -2, -3.
25. Student can list common oil contaminants.
26. Student can label types of oil filters used on power equipment.
27. Student can state guidelines for selecting and using oils.
28. Student can classify types of lubrication systems as for either 2 or 4 stroke cycle engines and identify terms associated with an engine lubrication system.
29. Student can list the functions of engine oil.
30. Student can interpret engine oil application charts used in owners/operators manuals.
31. Student can prepare pre-mixed fuel for a two stroke cycle engine.
32. Student can describe potential problems for oil/ fuel mixtures.
33. Student can describe oil filtration system.
34. Student can describe methods of checking oil level in an engine.
35. Student can describe effects of using alcohol based fuels.
36. Student can describe splash lubrication systems and pressure lubrication systems.
37. Student can change engine oil and filter on a variety of selected equipment.
38. Student can list the benefits of positive crank case ventilation.
39. Student can perform cooling system cleaning for cooled engine.
40. Student can demonstrate, remove & replace water pump and thermostat.
41. Student can identify types and grades of gasoline used in power equipment.
- 41 Student can identify the components and function of a crankcase ventilation breather assembly.

43. Student can service a crankcase breather assembly.
44. Student can describe proper cooling system cleaning methods.
45. Student can perform cooling system flush and cleaning of liquid cooled engine.
46. Student can describe proper method of carburetor cleaning.
47. Student can remove and replace a carburetor on a small gasoline engine.
48. Student can disassemble, clean, and reassemble carburetors.
49. Student can install a repair kit in a carburetor and inspect internal carburetor parts for wear.
50. Student can adjust carburetor choke linkage.
51. Student can adjust carburetor mixture screws per OEM specifications.
52. Student can adjust carburetor float level, adjust carburetor metering levers, remove, replace, and repair fuel lines and hoses, remove and replace the fuel tank filters, caps, and lines, and adjust the engine idle speed.
53. Student can describe the use of a fuel additive for storage.
54. Student can repair 3 different styles of rewind starters.
55. Student can perform starter drive gear replacement.
56. Student can describe equipment problems that can occur from operating equipment with a removed or damaged exhaust system.
57. Student can state the danger of operating a power product in a closed area
58. Student can describe the purpose of an exhaust deflector and describe the purpose of a spark arrestor screen.
59. Student can disassemble and reassemble 12 volt DC - 120 volt AC starter motor

Connections:

*Common Core State Standards
*KOSSA
*Common Core Technical Standards
*New Generation Science Standards
*Post-Secondary: KCTCS SET 110
*CTSO's – Skills USA

Cooperative Education I, II, III
Valid Course Codes
329101/329102/329103

Course Description

Cooperative Education provides supervised on-the-job work experience related to the students' educational objectives. Students participating in the Cooperative Education program receive compensation for their work.

Content/Process

Student Will:

1. Gain career awareness and the opportunity to test career choice(s)
2. Receive work experience related to career interests prior to graduation
3. Integrate classroom studies with work experience
4. Receive exposure to facilities and equipment unavailable in a classroom setting
5. Increase employability potential after graduation
6. Earn funds to help finance education expenses

Connections:

*Common Core State Standards
*KOSSA
*Common Core Technical Standards
*New Generation Science Standards
*Post-Secondary: KCTCS SET 199/299
*CTSO's – Skills USA

Small Engine Electrical Systems and Lab

Valid Course Codes

Class: 470840

Lab: 470841

Course Description

This course presents electrical systems and their application. Basic electrical theory, including electrical pressure, current, resistance and power measured in volts, amperes, and ohms is also presented. Ohm's law will be discussed with its application to electrical circuits. Basic circuits (series, parallel, and combination of series and parallel) will be discussed.

Content/Process

1. The student can demonstrate understanding of current flow in a circuit,
2. The student can define electrical terms.
3. The student can demonstrate understanding of relationship between magnetism and electrical flow.
4. The student can explain sources and uses of electricity.
5. The student can discuss the difference between a conductor and an insulator.
6. The student can identify the basic electrical measurements used in OPE including volts, amperes (amps) and ohms.
7. The student can demonstrate understanding of the nomenclature and function of electrical systems.
8. The student can identify electrical symbols used on wiring diagrams and schematics.
9. The student can demonstrate the ability to read OPE wire diagrams.
10. The student can demonstrate understanding of the nomenclature and function of electrical systems.
11. The student can identify electrical symbols used on wiring diagrams and schematics.
12. The student can demonstrate the ability to read OPE wire diagrams.
13. The student can draw a circuit diagram of a variety of selected equipment using correct symbols.
14. The student can explain how to measure current, voltage and resistance
15. The student can demonstrate the correct use of Digital Multi-Meter and DC shun.
16. The student can demonstrate proper use of analog electrical meters (Volts, Amps, and Ohms).
17. The student can perform battery specific gravity tests using two types of battery hydrometers.
18. The student can describe characteristics of electrical circuits.

19. The student can Diagram basic electrical circuits including: Series, Parallel, Series-Parallel.
20. The student can identify integrated circuit devices and explain their function.
21. The student can explain the different kinds of circuit failures.
22. The student can identify electrical/electronic circuit protection devices and explain their function.
23. The student can identify electrical circuit components and explain their function in electrical circuits.
24. The student can demonstrate the correct test procedures used to locate opens, shorts, and grounds.
26. The student can identify normally open/closed switch types.
25. The student can repair wire harness with various types of wire connectors and terminals.
- 27; The student can describe common wiring techniques for interlock switches.
28. The student can identify the connector lead on interlock switches.
29. The student can describe design, construction and operation of lead acid batteries.
30. The student can explain how storage batteries are constructed and how cells are connected to produce voltage.
31. The student can explain the common methods of rating batteries.
32. The student can describe the correct method using a battery for “jump starting”.
33. Student can explain the elements of AC and DC charging Systems.
34. Student can describe charging System Theory of Operation.
35. Student can describe alternator operation.
36. The student can explain charging system rectification.
37. The student can describe voltage regulation.
38. The student can disassemble an alternator and identify the parts and their functions.
39. The student can remove and replace 12 volt and 120 volt starter motor.
40. The student can identify and correct signs of corrosion in an electrical system.
41. The student can demonstrate the application of Silicone Dioxide on electrical connections.
43. The student can check applied voltages, circuit voltages, and voltage drops.
40. The student can identify and correct signs of corrosion in an electrical system.

42. The student can check continuity in electrical/ electronic circuits, components, and parts.
44. The student can check current flow.
45. The student can inspect, test, and replace fusible links, circuit breakers, and fuses.
46. The student can inspect, test, and replace diodes, resistors, and capacitors.
47. The student can check continuity in electrical/ electronic circuits, components in interlock circuit(s).
48. The student can demonstrate understanding of interlock systems' variations.
49. The student can analyze manufacturer interlock schematics.
50. The student can remove and replace under-flywheel alternator.
51. The student can remove, rebuild, bench test and replace alternator.
52. The student can test and replace starter relay and solenoids.
53. The student can repair or rebuild and test D.C. starting motor.
54. The student can describe basic electrical circuit problems.
55. The student can describe operation of permanent magnet starter motor.
56. Student can describe operation of a field wound starter motor.
57. The student can demonstrate key-off power drain test using DC shunt.
58. Given an electrically operated component or system with trouble symptoms installed, the student can solve the problem with the use of the proper manual and tools.

Connections:

- *Common Core State Standards
- *KOSSA
- *Common Core Technical Standards
- *New Generation Science Standards
- *Post-Secondary: KCTCS SET 200/220
- *CTSO's – Skills USA

Two Stroke Cycle Engine and Lab

Valid Course Codes

Class: 470822

Lab: 470823

Course Description

This course presents theory, repair, and overhaul methods of two-stroke cycle engines. Students learn to inspect engines for problems, follow a service manual for measuring cylinder bore, piston fit, ring clearance, rod clearance, crankshaft clearance, and valve training components. This course introduces students to the following special tools: cylinder hone, valve guide reamer, valve seat cutter, and valve grinder. Safety practices will be observed while using equipment.

Content/Processes

1. Student can check engine for top end
2. Student can check engine for base/primary compression (bottom end).
3. Student can inspect the fuel system for proper operation: Perform carburetor pressure test.
4. Student can inspect the ignition system for proper operation: Perform 3 point spark test
5. Student can inspect the exhaust port for carbon obstruction.
6. Student can check crankcase integrity with pressure/vacuum pump.
7. Student can operate the engine to check for proper starting and power output under load.
8. Student has viewed videos in power equipment safety
9. Student can demonstrate power equipment safety practices compression.
- 10 Student can demonstrate understanding of cutting attachment operation, replacement and sharpening: rotary blade, saw chain, hedge trimmer etc.
11. Student can explain ANSI standards i.e. kick back, operator presence etc.
12. Given a 2-cycle engine on a product with trouble symptoms installed, the student can solve the problem with the use of the proper manual and tools.
13. Student can disassemble engine, inspect measure, service and repair components.
14. Student can remove, service and replace an exhaust system.
15. Student can remove the cylinder and demonstrate de-carboning techniques.
16. Student can remove and inspect the connecting rod and piston, remove and inspect the crankshaft, remove and replace needle bearings, remove and replace main ball bearings and inspect measure, service or replace all components.
17. Student can demonstrate 2 cycle piston ring installation and demonstrate 2 cycle piston ring groove cleaning.

18. Student can inspect reed valves.

19. Student can inspect intake side of piston skirt on piston ported engines valves.

20. Student can repair damaged spark plug threads using thread repair device.

21. Student can inspect and repair the recoil starting system.

22. Student can inspect and service clutch assembly.

Connections:

*Common Core State Standards

*KOSSA

*Common Core Technical Standards

*New Generation Science Standards

*Post-Secondary: KCTCS SET 250/118

*CTSO's – Skills USA

Four Stroke Engine (Small Engine Repair) and Lab
Valid Course Codes
Class: 470814
Lab: 470815

Course Description
This course presents theory, repair, and overhaul methods of four-cycle engines. The student will learn to inspect engines for problems, follow service manuals for measuring cylinder bore, piston fit, ring clearance, rod clearance, crankshaft clearance, and valve train components. The student will use special tools including a cylinder hone, valve guide reamer, valve seat cutter, and valve grinder, and demonstrate safety practices while using this equipment.
Content/Processes
<ol style="list-style-type: none">1. Student can check the fuel pump pressure.2. Student can pressure test carburetor.3. Student can operate the engine to check for proper starting and acceleration4. Student can differentiate hunting/surging symptom between fuel system or governor system.5. Student can perform cylinder balance test and demonstrate understanding of findings.6. Student can perform cylinder compression test.7. Student can perform cylinder leak down test.8. Student can perform engine crank case vacuum test.9. Student can perform oil pressure test.10. Student can test an ignition system using spark tester.11. Student can understand the effect of a partially sheared flywheel key.12. Student can remove, inspect and replace points and condenser13. Student can remove and replace an ignition armature (ignition coil, ignition module).14. Student can test and replace ignition armature assembly.15. Student can test and replace high tension lead(s)16. Student can test solid state transistor controlled discharge system.17. Student can test capacitive ignition system.18. Student can demonstrate timing procedure for points style.19. Student can demonstrate timing procedure solid state/electronic style.20. Student can measure primary and secondary resistance.

21. Student can check/replace engine ignition kill switch.
22. Student can inspect the cooling system.
23. Student can check for damage to the fins or fan.
24. Student can identify debris clogging air fins.
25. Student can identify the proper order of an air intake system assembly.
24. Student can remove and replace intake manifold.
25. Given a 4-cycle engine on a product with trouble symptoms installed, the student can solve the problem with the use of the proper manual and tools.

Connections:

- *Common Core State Standards
- *KOSSA
- *Common Core Technical Standards
- *New Generation Science Standards
- *Post-Secondary: KCTCS SET 240/221
- *CTSO's – Skills USA

Small Engine Failure and Repair Analysis and Lab
Valid Course Codes
Class: 470816
Lab: 470817

Course Description
This course includes hands-on experience, step-by-step procedures for disassembling engines, identification of engine components, inspection of parts, performing precision measurements on crankshaft, cylinder bore and valves, and the reassembly of the engines. Also included are training in diagnostic procedures needed to pinpoint failure and determine proper repair.
Content/Processes
<ol style="list-style-type: none">1. Student can classify failures into 5 major categories.2, student can identify the effects of abrasive ingestion on engine components.3. Student can accurately identify the entrance path of abrasives on several engine failure examples.4. Student can identify the effects of insufficient lubrication on engine components: piston cylinders etc.5. Student can accurately define cause of failure on several engine failure examples.6. Student can accurately identify 2 stroke lubrication /fuel quality failure root cause.7. Student can identify the use of incorrect or no lubricant.8. Student can identify and describe engine failures caused by breakdown of fuel.9. Student can identify the effects of overheating on engine component parts.10. Student can accurately define the root cause of failure on several engine failure examples.11. Student can accurately identify the entrance path of abrasives on several engine failure examples.12. Student can identify overheating effects on 2 stroke engines due to poor exhaust system maintenance, i.e., piston carbon scoring.13. Student can define detonation, pre ignition and effects on engine components.14. Student can accurately identify 2 stroke lubrication /fuel quality failure root cause.15. Student can identify 2 stroke engine failures caused by stale fuel.16. Student can identify engine failure caused by lean mixture.17. Student can identify the effects of over speeding on engine component parts.18. Student can identify the signature break on a connecting rod on several engine failure examples.19. Student can identify exhaust port piston scoring and large end bearings due to over speeding.20. Student can identify the effects of excessive vibration on engine block and mounting base.

21. Given a sample of various failed components, the student can identify the symptoms, type and causes of the failures.

Connections:

*Common Core State Standards

*KOSSA

*Common Core Technical Standards

*New Generation Science Standards

*Post-Secondary: KCTCS SET 233/237

*CTSO's – Skills USA